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# WIND DRIFT AND DISSEMINATION OF INSECTS.

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It is over a decade since the writer made a critical examination of literature in relation to the aerial movements of insects (See N. Y. State Museum Bulletin 274, P. 59-129, 1928). Subsequent data has tended to confirm rather than to weaken the conclusions incident to that study.

It should be noted that many insect movements through the air are termed migration, the word presumably being used in a somewhat loose manner and in a sense quite different from that implied when speaking of bird migration. This is clearly brought out in the report of the U. S. Entomological Commission upon the Rocky Mountain locust in which it is stated that the insects seldom migrate except when the air is in motion and that, as a rule, the locusts depend almost wholly upon the wind, simply using their wings to sustain themselves and generally head into the wind. In other words, the migration in this case is the difference between the velocity of flight in one direction and the wind drift in the opposite.

It is well known that insects take to the air and the general assumption is that species found at some distance from their natural habitat have been carried by wind storms of exceptional severity. That does occur. It is not in our judgment the principal cause. Convectional currents, really nature's escalators, and moderate wind velocities, it is believed, are far more important in the aerial transportation of insects. The convectional current is important since it raises flying insects with little or no effort on their part to considerable heights. It is the convectional currents which produce the bumpy conditions troublesome to aviators, and, in the warmer parts of the earth, these effects may be felt up to elevations of fifteen thousand feet. The balloon work conducted under the writer's direction in 1923-25 by the New York State Conservation Commission and the later releases in 1936 and 1937 at the Bartlett Tree Research Laboratories afford numerous demonstrations of the lifting power of convectional currents. Balloons barely able to sustain themselves over grassy areas are quickly raised to several hundred feet and possibly a thousand feet or more when they drift over bare ground due to the air currents rising from these warmer surfaces.

The annual appearance of the cotton moth, *Alabama argillacea*, in New England and even in southern Ontario, is a matter of common knowledge and the more we consider the problem, the stronger becomes our belief that this is in reality wind drift and not flight in the sense that a considerable proportion of the distance is covered by the efforts of the moths themselves.

The finding in 1924 of a large aphid, *Dilachnus piceae*, and a flower fly, *Syrphus ribesii*, in barren, mostly ice clad North East Land, north latitude 80°, in such numbers as to suggest that "hundreds of thousands or even millions"

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must have drifted 800 miles over sea from the Kola peninsula, belongs in the same category though not so commonly observed. Neither of these are impossible since we have recorded balloon drifts at the rate of 100 miles per hour in one case and velocities approaching this in a number of others. One of our balloons drifted from western New England, Salisbury, Conn., to off the coast of Newfoundland, a distance of 775 miles. There is unquestioned evidence of wind drift possibilities in the carriage of young gypsy moth caterpillars over the water for distances of six and thirteen and a half miles to the Isles of Shoals off the coast of New Hampshire and to Provincetown, Mass., across Cape Cod Bay, over distances of nineteen to thirty miles. It appears possible in this connection that wind carriage of gypsy moth larvae from badly infested areas may result in a general and severe infestation in one season in woodlands previously free of the pest. Something of the same nature, though not clearly established by experimental data, appears probable with young canker worms.

There is the early record of the spread of the Colorado potato beetle, *Leptinotarsa decimlineata,* it approximating eighty miles a year. It is well known as a strong flier and yet prior to our study of roof insects in 1927, the roof being nearly 150 feet high and well above the tops of nearby trees, it is doubtful if the general occurence of this insect a hundred feet or more in the air was suspected. Several species of *Calligrapha,* insects of about the same weight as the Colorado potato beetle, were also taken on the roof rather commonly. Possibly the most surprising of these captures was the plantain leaf miner, *Dibolia borealis,* a feeder on one of the lowest plants. Fifteen species of lady beetles were among the roof collections, the two-spotted lady beetle, *Adalia bipunctata,* being very common throughout much of the season. It is well known that lady beetles are found in great numbers on mountain tops and the recent note in the May 1938 issue of the Journal of Economic Entomology by Doctor Franklin Sherman gives interesting data upon the gatherings of these insects on mountain summits in the southeastern United States. Lady beetles feed on aphids and a little consideration suggest that they must fly readily in order to find the variable and widely scattered infestations of their hosts. The collections on these mountain tops, it seems to the writer, may be explained by wind drift carrying large numbers to the summit and there the natural flattening of the current of air as it moves over the elevation and the lower temperatures, especially toward evening, would hasten the alighting or dropping of many of these insects. The Mexican bean beetle, *Epilachna varivestis,* in its spread from the southwest, is recorded as extending its range about one hundred fifty miles a year and the appearance of this insect in 1929 in southwestern New England indicates an extension that season of presumably at least fifty and probably a hundred miles or more, all suggesting that the lady beetles, even phytophagous species, may remain in the air for considerable periods and be carried relatively long distances by wind currents.

The appearance in New Jersey in 1933 of the Dutch Elm Disease and the later demonstration that the European elm bark beetle, *Scolytus multistriatus,* was the principal carrier, raised the possibilities of wind drift, in relation to Coleoptera in particular, to a problem of considerable economic importance. It is

noteworthy that the distribution of the disease has been confined largely to an area within about fifty miles of New York City, and that in 1934 an affected tree was located at Old Lyme, Conn., eighty miles east of the then nearest known diseased tree. This properly raised a vital question as to the origin of the infection. It is our belief that the disease was carried by drifting European elm bark beetles and it is worthy of note that the finding in 1936 of diseased trees at Branford and Guilford, Conn., does much to bridge the gap between the earlier affected trees and those at Old Lyme.

Some have doubted the ability of bark beetles to fly any such distance. Again, we emphasize drift rather than flight. The related larger and heavier hickory bark beetle, *Scolytus quadrispinosus,* was taken on the roof of the New York State Education building in 1927 fully three quarters of a mile from the nearest hickories. Three species of pine bark beetles, *Ips calligraphus, I. grandicollis,* and *I. pini,* were also taken on the roof of this building that year. There is evidence to indicate that swarms of pine bark beetles may be carried considerable distances, 100 miles or more, as estimated by Dr. A. D. Hopkins, by favorable winds. The probability of this occuring is supported by airplane trapping by Federal Bureau of Entomology agents in Louisiana, two species of Xyleborus being taken at an elevation of 2000 feet, another at 500 feet and four other species of Scolytids at 200 feet.

The possibilities of such spread were also explored by the release of nearly five thousand small balloons in 1936, all within the affected territory and mostly at Stamford, Conn., and a similar number in 1937 at Stamford, Conn. A marked tendency was demonstrated for the balloons to drift along the southern shore of Connecticut although many were carried southeasterly, and it is our belief that considerable numbers were carried across the sound over Long Island and were lost in the Atlantic Ocean. The record of shore line towns for diseased trees located from 1933 to 1936 is as follows: Greenwich 133, Stamford 45, Darien 24, Norwalk 13, Westport 4, Fairfield 2, Branford and Guilford 1, and Old Lyme 6, the increase in the last named locality evidently being due to local spread. It will be noted that the number of diseased trees varies inversly with the distance from New York. A very considerable prevalence of easterly and southeasterly winds undoubtedly carried many of the European elm bark beetles out to sea thus aiding in the restriction of the infected area to the southern shore of Westchester County, N. Y., and southern Connecticut. This aerial drift of insects out to sea is also confirmed by the finding in recent years of vast numbers of Japanese beetles along the beaches of New Jersey and Long Island.

The possibility of a somewhat definite air drift of insects is suggested by the fact that in 1936 three balloons were returned from Center Moriches on the south shore of Long Island, two being found on the same farm within sixty rods of each other and all being released at North Stamford, Conn., an airline distance of forty miles. A somewhat similar record was obtained from balloon releases in 1937 in recoveries from Rhode Island, three being returned from Pawtucket, a distance of 115 milees from the point of liberation, one from nearby Providence, and eight others were found within a relatively short distance considering the length of the drift. That this may also occur with insects is suggested

by the report of Professor W. D. Whitcomb on the distribution of the apple leaf-curling midge, *Dasyneura mali*, from Westford, Mass., in the northeastern part of the state, to Sanford and Alfred, Me., the former six and the latter twenty-six miles from previously known infestations. There were no intermediate infested orchards discoverable, and the one at Westford had been under such close supervision in 1935 that an earlier infestation could hardly have escaped notice.

The recent appearance of the European spruce sawfly, *Diprion polytomum*, in northern New York State and over much of New England is most suggestive of extensive wind drift from the Gaspe region of Canada. The probabilities are that this enormous area was strewn by air currents with drifting sawflies, and the subsequent location of infestations confirms the efficiency of winds as carriers of insects. The early history of the larch sawfly, *Nematus erichsonii*, another introduced species, suggests that its distribution in the northern United States and southern Canada was brought about by winds, and it seems probable that the spread of the more recent European spruce sawfly will duplicate in considerable measure that of the larch sawfly. A similar, though apparently not so extensive spread, is now in progress in the case of the larch case bearer, *Coleophora laricella*, an insect which in recent years has become distributed in the forested areas of western New England and probably northern New York.

One cannot hope to control air currents to any material extent. The relation between them and the dissemination of insects has an important bearing on certain phases of quarantine and control work. This is particularly the case where the knowledge of the origin of the insect and its probable line of movement are of service.

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## MISCELLANEOUS LEAFHOPPERS WITH DESCRIPTIONS OF FIVE NEW SPECIES (HOMOPTERA CICADELLIDAE)*

BY R. H. BEAMER,

Lawrence, Kansas.

### Sanctanus balli n. sp.

Resembling *Sanctanus sanctus* (Say) but with the vertex blunter, the male styles with apical third with parallel sides, apices truncate and quite deep notch on outer margin. Length 5-5.75 mm.

Vertex slightly more than a right angle; length of middle less than width between eyes; disc almost concave; pronotum quite highly arched; elytra long, apex broad.

General ground color milky-white tinged with yellow on vertex, pronotum and scutellum. Vertex with two very small darker spots either side middle near apex and two indefinite slightly larger darker angled dashes next base. Pronotum and scutellum mottled in appearance, not definitely colored. Elytra with the typical fuscous cruciate mark near middle and a narrow fuscous stripe on crossveins, Y-shaped on mesal margin, mesal cruciate mark darker on its margins.

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*Contribution from the Dept. of Entomology, University of Kansas, Illustrations by Miss Maxine Graham.

*Genitalia*: Last ventral segment of female about one-third longer than preceding, lateral margins straight to slightly rounded outer corner, posterior margin undulating, almost straight across with a slight, sharp V-shaped notch at middle, embrowned either side. Male valve obtusely angular; plates wider than valve at base, outer margins roundingly converging to sharp apices; styles short compared to *Sanctanus sanctus* with deep notch near outer third on outer margin, from there to tip sides are parallel or slightly enlarged with apices truncate; aedeagus in lateral view bent dorsally, margins almost parallel, enlarged near outer fourth to form a semi-sagittate tip.

*Holotype*, male, *allotype*, female, and numerous *paratypes*, Tubac, Arizona, August 21, 1935, R. H. Beamer; other paratypes, Patagonia, Arizona, August 21, 1935, R. H. Beamer.

Types in Snow Entomological Collections, University of Kansas.

### **Sanctanus sanctus** (Say)

*Jassus sanctus* Say, Jl. Acad. Nat. Sci. Phila., p. 307, 1831.

Say's description of this species is as follows:

"Hemelytra white, with a common brown cruciate mark.

Inhabits Indiana.

Body yellowish-white: head subacute, with two (308) minute fuscous points near the tip and an undulated line on the anterior edge; thorax dusky across the middle: hemelytra white, somewhat opalescent, with a common large cruciform mark on the middle, composed of brownish spots with blackish edges and including a whitish common spot; tip with large spots; venter with a dusky band and small lateral spots; feet immaculate.

Length to tip of hemelytra nearly one-fifth of an inch."

Vertex very sharp, about as long as wide, almost flat; head wider than pronotum; elytra long with apex broad, two cross nervures.

General color grayish white tinged with tawny and marked with fuscous; vertex with a semblance of four tiny darker spots; front with usual brown arcs; elytra with the dark cruciate mark forming a dark band near middle, margins of this band usually darker; another dark band in region of cross-veins and apex, veins and lighter areas almost milk-white.

*Genitalia*: Valve of male obtusely rounded, plates about as wide as valve at base, evenly narrowed on outer margin to sharp apices; styles much narrowed on outer two-thirds, notched on outer margin near middle, narrowing but slightly from there to tip; aedeagus in lateral view widest near base, slightly narrowing to rounded apex with a pair of blunt ventral teeth near tip; apex in ventral view slightly bifid.

The male from Rankin, Missouri, June 28, 1930, described above is here designated neotype.

### **Laevicephalus incisurus** DeLong

*Deltocephalus concinnus* var. *incisurus* DeLong, Ohio State Univ. Studies, Vol. II, p. 77, 1926.

Described from one specimen, Ladysmith, Wisconsin. Nine females and two males of this interesting leafhopper were collected this last summer (1937) about a small lake near Cowan, Manitoba.

The male resembles the female but smaller, vertex blunter, with disc not so flat.

*Genitalia*: Pygofer of male narrowing on outer third to less than one-fourth basal width; valve with apex truncate; plates wider than valve at base, outer margins straight, narrowed to sharp apices; style sharply narrowed on outer margin near outer third, this portion contracting and curving out to sharp point; aedeagus in lateral view narrow, bent dorsally at right angles near middle in ventral view about half as wide as long, sharply narrowed on outer fourth with pair of lateral retrorse processes near opening of canal.

*Allotype,* male and one parallotype, Cowan, Manitoba, August 7, 1937, R. H. Beamer.

### **Flexamia grammica** Ball

*Deltocephalus grammicus* Ball, Can. Ent., XXXII, p. 204, 1900.

Doctor Ball described this species from females only. The males are like the females except smaller in size.

*Genitalia*: Valve of male long and sharply angular; plates wider at base than valve, outer margin sinuate but not narrrowed until just before tip, apex rounded to mesal margin; style deeply notched on outer fourth and again at apex, giving a bifid appearance; aedeagus in lateral view long, moderately curved dorsally, widest at base, holding that width to about middle where ventral margin abruptly converges to less than half basal width; in ventral view shaft straight narrow to sharp apex with a pair of lateral recurved flaring processes, one of which is about twice as long as other.

*Allotype,* male and numerous parallotypes, Medora, Kansas, June 24, 1936, R. H. Beamer and P. W. Oman.

Types in Snow Entomological Collection and U.S. National Museum. Other specimens are at hand from Wyoming and North Dakota.

### **Palus delector** DeL & Slees

This species was described from a single male.

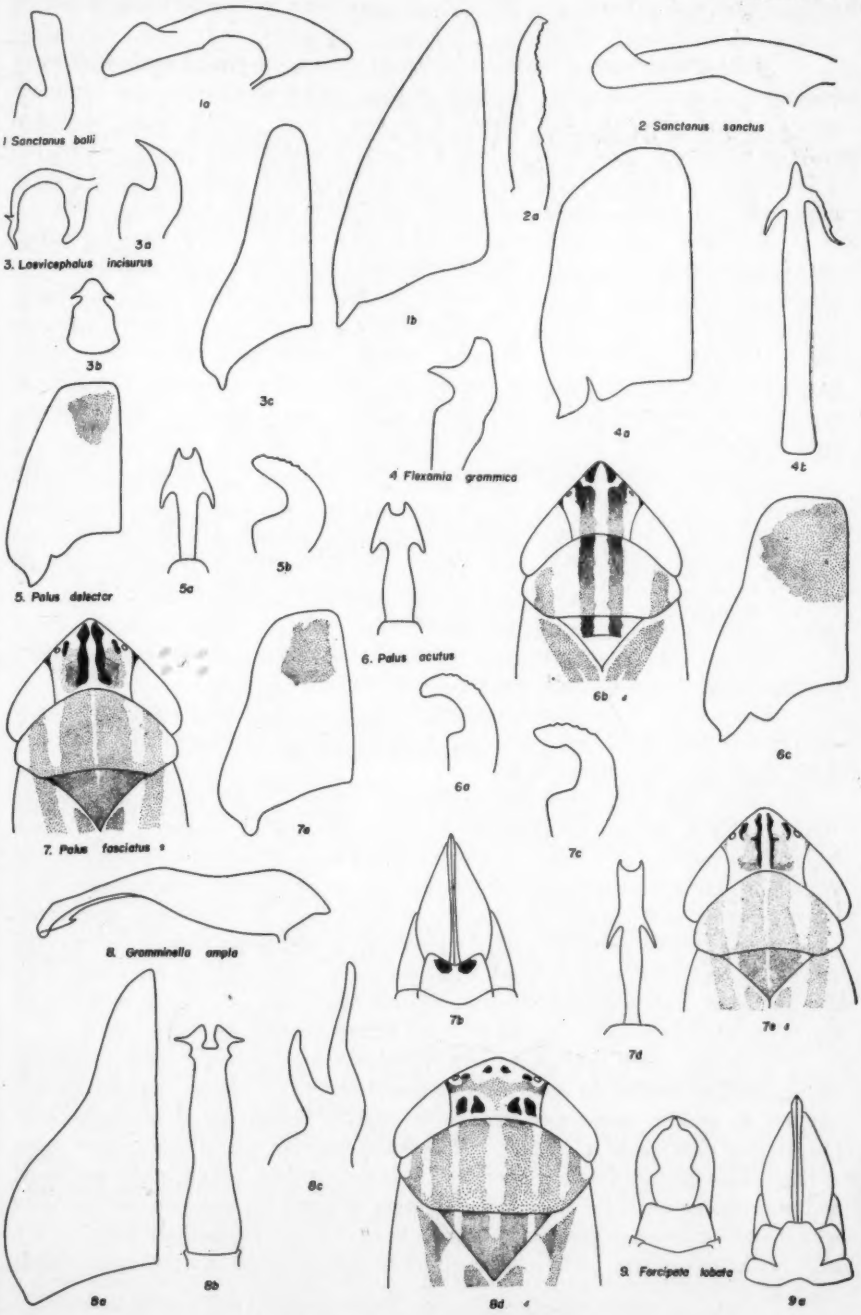
Female like the male, but larger, with the vertex not quite so acute and the elytra barely as long as the abdomen.

*Genitalia*: Last ventral segment of female slightly longer than preceding, lateral margins angled to meet posterior margin on outer fourth, posterior margin slightly excavated to a pair of embrowned teeth separated by a more or less irregularly margined notch.

*Allotype,* female, Florence, Wisconsin, August 19, 1937, R. H. Beamer; parallotypes 13 females, same data, and 10 females, same data, except collected by C. L. Johnston. Six males were also taken at this locality. The species was also taken at Brule, Wisconsin, and on top of Rib Mountain, Rib Mountain State Park, Wisconsin. It was swept from a sedge growing usually in rather a dry, sandy situation. The leafhoppers were usually found in the shade of trees.

### **Palus acutus** n. sp.

Resembling *Palus delector* DeL. & Slees, but distinctly larger, vertex more pointed, elytra of female distinctly longer than abdomen and male aedeagus in ventral view with shaft widest at base. Length 3.75-4 mm.




MISCELLANEOUS LEAFHOPPERS

Vertex very long and acute, less than a right angle, one-third longer at middle than width between eyes; elytra longer than abdomen, margins almost parallel, apices broad.

General color tawny marked with light brown to fuscous. Vertex with black angular spot either side apex, just back of these an L-shaped black spot continues across vertex, pronotum and scutellum as two tawny parallel lines; pronotum with an additional stripe back of each eye; elytra with veins lighter, cells tawny, a black spot on mesal margin almost to apex, three light areas on costal margin near recurrent veins, area between these light spots darker, also apical cells.

*Genitalia*: Last ventral segment of female slightly longer than preceding, outer corner of lateral margin slightly rounded; posterior margin slightly excavated to a rather broad, V-shaped median notch, embrowned on margins. Valve of male angulate; plates about as wide as valve, outer margins straight, converging to truncate apices, inner margins longest, outer third embrowned; styles narrowed on outer third, evenly curved out, inner margin serrate; aedeagus in ventral view short and stout, shaft except sagittate apex, widest at base, sagittate apex with short, sharp retrorse spines, about half as long as in *P. delector*.

*Holotype*, male, Hartstown B'g, Pennsylvania, June 21, 1921, D. M. DeLong.

*Allotype*, female, Gary, Indiana, June 24, 1934, M. W. Sanderson.

*Paratypes*, one female, same data as holotype; one female, same data as allotype; and one female, Amana, Iowa, June 23, 1928, G. O. Hendrickson.

**Palus fasciatus** n. sp.

Resembling *Palus marginatus* (DeL.) but vertex blunter and without marginal black line next face. Length 4.-4.5 mm.

Head wider than pronotum; vertex about a right angle, length at middle slightly less than width between eyes; elytra as long as or longer than abdomen, sides almost parallel, apices broad.

Color yellowish white to semihyaline, marked with brown and black. Vertex with a median longitudinal white stripe usually bordered with black which is a portion of a pair of longitudinal brown stripes that extend across scutellum; ocelli partially surrounded by two comma-shaped dark spots; face usually tawny with faintest indication of dark arcs in occasional specimens; pronotum with two pairs of buff, longitudinal stripes along with scutellum, occasionally becoming entirely dark. Elytra with veins lighter margined with fuscous, light spots scattered about at end of claval veins, on costal margin near recurved veins, in apical cells and at veins unions anterior to costal plaque.

*Genitalia*: Last ventral segment of female slightly longer than preceding, lateral margins angled on outer half to posterior margin which is angularly excavated to middle, some specimens with slightly deeper mesal notch, sizeable brown spot either side of middle. Male valve angular, plates wider than valve at base, outer margin sinuately narrowed to broad rounded apices; styles narrowed and curved out on outer third, inner margin serrate; aedeagus in ventral view widest just before sagittate apex, sagittate head occupies almost half shaft, with a pair of sharp, retrorse barbs at base about as long as head is wide, apex roundingly bifid.

*Holotype,* male, *allotype,* female, two male and twenty female *paratypes,* Tokio, North Dakota, July 28, 1937, R. H. Beamer; other paratypes numerous specimens Swan River, Manitoba, August 2, 1937, R. H. Beamer.

Collected in low swampy ground.

### **Graminella ampla** n. sp.

Resembling *Graminella fitchi* (V.D.) but much larger, last ventral segment of female without median tooth in the excavation and aedeagus of male with a sharp lateral tooth at apex. Length, male 4.75, female 5.25 mm.

Vertex slightly blunter than in *G. fitchi* (V.D.); lateral margins more nearly straight.

Color: General color as in *G. fitchi,* but somewhat darker. Four black spots on margin of vertex smaller than in that species. Pronotum with same seven white longitudinal light stripes. Veins of elytra light, cell much darker tawny.

*Genitalia*: Last ventral segment of female with lateral margins broadly excavated, exposing underlying membrane, posterior margin roundingly excavated, almost half length of segment, margin of excavation embrowned. Male valve obtusely angled, plates wider than valve at base, holding this width about one-third their length, then abruptly narrowed to slender, sharp apices; styles with bifurcate apices, inner finger-like process about one-third longer than outer, curving mesally at tip; aedeagus in ventral view broad at base, slightly narrowing toward apex with a pair of sharp lateral teeth near rounded tip.

*Holotype,* male, *allotype,* female, and numerous *paratypes,* Tokio, North Dakota, August 28, 1937, R. H. Beamer.

This species was swept from a large, swamp grass in bed of an old lake.

Types in Snow Entomological Collection.

### **Forcipata lobata** n. sp.

Resembling *Forcipata triquetra* DeL. & Cald. but smaller, and male plates with rounded lobe on inner margin near middle. Length 2.75 mm.

Vertex conical, slightly less than a right angle, almost twice as wide between eyes as length at middle.

Color: Greenish yellow, apices of elytra subhyaline.

*Genitalia*: Lobe of last ventral segment of female large, broader at base, margins rounded, apex flat, slightly excavated; lateral lobes narrow, scarcely produced, notch between lobes closed. Male valve quadrangular, posterior margin roundingly concave; plate about 3 times as long as valve, curved in with a rounded lobe on inner margin near middle, apices excavated on inner margin to sharp point on outer. Aedeagus in lateral view widest at base, narrowing to sharp tip, rather evenly curved dorsally.

*Holotype,* male, *allotype,* female, three male and seven female *paratypes,* Douglas Lake, Michigan, August 22, 1937, R. H. Beamer. Three female paratypes, Thompson, Michigan, August 25, 1937, R. H. Beamer.

Types in Snow Entomological Collection.

EXPLANATION OF PLATE 18

1. *Sanctanus balli* n. sp., end of style; 1a, lateral view of aedeagus; 1b, plate of male.
2. *Sanctanus sanctus* (Say), lateral view of aedeagus; 2a, outer portion of style.

3. *Laevicephalus incisurus* DeLong, lateral view of aedeagus; 3a, apex of style; 3b, ventral view of aedeagus.
4. *Flexammia grammica* (Ball), apex of style; 4a, plate of male; 4b, ventral view of aedeagus.
5. *Palus delector* DeLong and Slees, plate of male; 5a, ventral view of aedeagus; 5b, apical portion of style.
6. *Palus acutus* n. sp., ventral view of aedeagus; 6a, apical portion of style; 6b, head of male; 6c, plate of mole.
7. *Palus fasciatus* n. sp., head of female; 7a. plate of male; 7b, last ventral segment of female; 7c, apical portion of style; 7d, dorsal view of aedeagus; 7a, head of male.
8. *Graminella ampla* n. sp., lateral view of aedeagus; 8a, plate of male; 8b, ventral of view of aedeagus; 8c, apical portion of style; 8d, head of female.
9. *Forcipata lobata* n. sp., ventral view of male; 9a, ventral view of abdomen of female.

## NOTES ON THE GENUS PROTARCHOIDES (HYMEN., ICHNEUMONIDAE)*

BY C. STUART WALLEY,
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The following notes were assembled in arranging the *Protarchoides* material in the National Collection. In establishing the identity of *Protarchoides mellipes* (Prov.) it has been found necessary to synonymize one species. A species allied to *mellipes* is described as new and a table is provided for the separation of the four known North American species. The recording of *Trichiosoma* as host for a member of this genus is further evidence of the close relationship of the genus with *Protarchus* Foer.

KEY TO SPECIES

1. Hind tibia and tarsus black, the tarsus strongly compressed ..... 2
   Hind tibia and tarsus testaceous, the tarsus only very weakly compressed 3
2. Mandibles largely or entirely yellow; lateral abcissae of apical propodeal carina distinct; areolet rather large with a short petiole; discocubitus distinctly angulate with more or less distinct ramellus .... *mandibularis* Cush.
   Mandibles black; lateral abcissae of apical propodeal carina obsolete; areolet small with a long petiole; discocubitus sinuate without ramellus ..... *longipes* Cush.
3. Flagellum black with a broad sub-median pale testaceous annulus; coxae and trochanters black; abdomen entirely black ..... *mellipes* (Prov!).
   Flagellum uniformly dull testaceous; coxae and trochanters testaceous, the former with a blackish spot above; first tergite of abdomen testaceous .... ..... *pallidicornis* n. sp.

### Protarchoides mandibularis Cush.

*Protarchoides mandibularis* Cushman, Proc. U. S. N. M. LXIV, Art. 20, page 9, 1924.

Two specimens at hand, a male and female from Aylmer and Hemmingford, Que., respectively, are considered to be *mandibularis* though they differ in several regards from the original description of that species.

In the female the mandibles are yellowish-stramineous with the teeth and a spot at base fuscous; the maxillary and labial palpi are stramineous; the pronotal impressions are poorly defined, not setting off distinctly the convex upper portion of pronotum. Otherwise the female agrees with the description of *mandibularis*. The length is 15 mm.

*Contribution from the Division of Entomology, (Systematic Entomology), Department of Agriculture, Ottawa.

The male agrees in size and structure with the above female. In it the entire face below antenna, clypeus, mandibles, palpi and tegulae, also a spot on the scape below, are sordid yellowish; there is a trace of a yellowish spot below the tegula and the posterior margin of mesopleurum is yellowish-stramineous. The leg color does not appear to be completely developed, the testaceous portions of the legs being paler than in the female, and the hind tibia are yellowish at the base shading to dark brownish beyond, with hind tarsi almost black.

The male was reared from the cocoon of a species of *Trichiosoma*.

### Protarchoides longipes Cush.

*Protarchoides longipes* Cushman, Proc. U. S. N. M. LXI, Art. 8, p. 26, 1922.

This species, the genotype, is known only from the female type from Mt. Washington, New Hampshire. It is evidently very similar if not identical with *mandibularis* as has been noted by Cushman, and the characters used in the acompanying key to separate the two species should be regarded as provisional.

### Protarchoides mellipes (Prov.)

*Coleocentrus mellipes* Provancher, Add. et Corr. au Vol. II, Faun. Ent. Can., Hymen., p. 113, 1889. Male.
*Coleocentrus mellipes* Provancher, Cushman and Rohwer, Proc. U. S. N. M. LVII, 507, 1920.
*Protarchoides pallipes* Cushman, Proc. U. S. N. M. LXXII, Art. 13, p. 15, 1927, female, (new synonymy).

Provancher described *Coleocentrus mellipes* from a male specimen said to be from the Rocky Mountains, sent to him by the late Captain Gamble Geddes of Toronto, Ont. Recent workers have been unable to locate the type specimen in the Provancher Collection and it was assumed that it had probably been returned to the collector and subsequently lost. A number of years ago a quantity of miscellaneous hymenopterous material passed from the Geddes' collection to the National Collection at Ottawa, and among it has been found a specimen bearing a label in red ink in Geddes' hand, "*Coleocentrus* n. sp." Upon examination it has been found to agree very exactly with the description of *mellipes*, the only point at variance being the dark rufo-piceous clypeus and a similar but fainter spot at the middle of the face.

This specimen pertains not to *Coleocentrus* but to the Mesoleiina where it falls in the genus *Protarchoides* Cush. Provancher gave evidence of some hesitancy in placing *mellipes* as a *Coleocentrus* and subsequent workers have found the description of *mellipes* a discordant element when dealing with *Coleocentrus*.

Though positive data in the form of definite type or species labels are lacking the writer feels that there is very little doubt that the above specimen is actually the type of *mellipes* and it is here accepted as such. There is in the National Collection a female, from Smoky Falls (near Kapuskasing) Ont., Aug. 9, 1937 (R. V. Whelan), which the writer had determined as *Protarchoides pallipes* Cush. This specimen agree exceedingly well with the male type of *mellipes* and there appears to be no doubt that they are opposite sexes of the same species.

A fourth species closely related in structure to *mellipes* is at hand and is described as follows.

### Protarchoides pallidicornis n. sp.

*Female*—Length 15 mm. Structurally very similar to *mellipes*, differing from that species only as follows: ocelli slightly smaller; median longitudinal carinae of propodeum very irregular and less strongly elevated.

Ground color black, paler as follows, face, clypeus, mandibles, palpi, malar space narrowly adjacent mandible, narrow margin along hypostome, posterior orbits above middle of eye, scape and pedicel below and entire flagellum, legs except spot on coxae, narrow line along notauli, scutellum except at apex, tegulae, small spot before and below tegula, speculum, more or less of anterior and posterior margins of mesopleura, spiracular area of propodeum, first tergite of abdomen and extreme apex of sheath, dull testaceous, the legs especially apically paler; wings as in *pallipes*.

*Holotype*—♀, Smoky Falls (near Kapuskasing), Aug. 4, 1937 (R. V. Whalen). No. 4410 in the Canadian National Collection, Ottawa, Ont.

## SOLENOPSIS ROSELLA KENNEDY, A NEW ANT FROM SOUTHERN ONTARIO.*

BY CLARENCE HAMILTON KENNEDY,
Ohio State University, Columbus, Ohio.

While on an ant-collecting trip to Pelee Point, Ontario, August 6, 1931, with Dr. Mary Talbot, Miss Mable Schramm and Prof. Merle G. McFadden, the writer found a queen (Coll. No. 526), the first specimen of this new *Solenopsis*. The striking rose pink color of the gaster was a shade of red we had not found before in any of the ants of this region.

While working on the sand plain along the west side of the sand spit on the south shore of Pelee Island, June 25, 1934, with Dr. Mary Talbot, Dr. C. A. Dennis and Prof. Mark A. Shellhaas we discovered three nests of this ant, in each case in coarse, damp (almost wet) sand and in association with the nest of a larger ant. Neither Dr. Talbot nor I have searched specifically for this ant since.

### **Solenopsis rosella** Kennedy

*Holotype*, winged queen from nest No. 1372, Kennedy collection. Figs. 3, 5 and 6.

Length 4.5 mm. dried (females in alcohol 5 mm.).

Head (Fig. 5) with length to width as 8.5 to 7.5, the posterior contour rounded from eye to eye making almost a half circle while the sides below the eyes converge slightly to the bases of the mandibles. Clypeal border projecting, terminating in two prominent teeth which are the lower ends of diverging clypeal carinae. Lateral denticles feeble, each with a bristle one third as long as mandible. Frontal area a triangle with its narrow posterior angle rounded, while below it is open into the area between the clypeal carinae. Mandibles with outer side flattened at base; each with four teeth, the outer tooth twice as long as either of the next two, the inner tooth minute. Antennal scape in repose reaching to middle of lateral ocellus. First segment of funicle (fig. 3) equal in length to segs. 2-4 together. Seg. 2 of funicle slightly wider than long but appearing longer than wide because seg. 3 is so distinctly wider than long (seg. 3, width to length as 3 to 2). Segs. 2-8 all wider than long. First segment of club one half as long as the second or terminal segment.

*This article and the work on which it reports was done at the Franz Theodore Stone Biological Laboratory of Ohio State University.

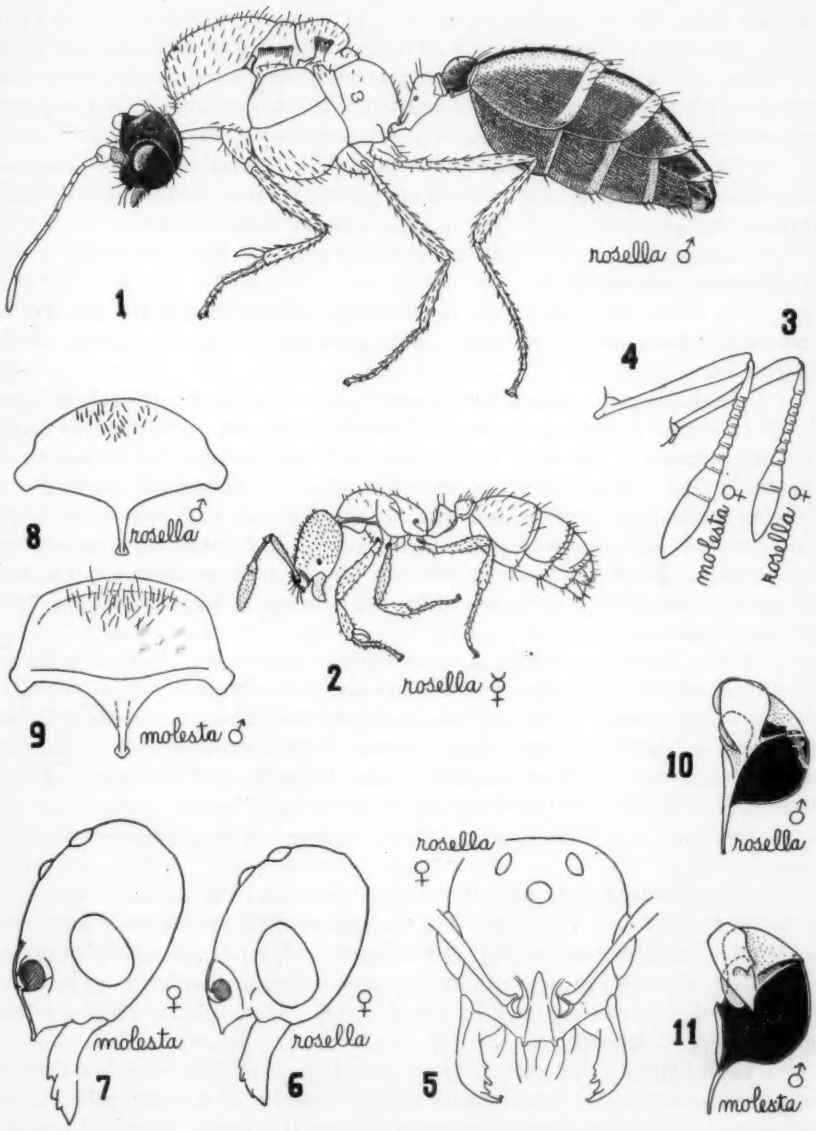



Fig. 1. Male of *Solenopsis rosella* n. sp. from nest No. 1272. 2. Worker of *rosella*. 3. Antenna of queen. 5 and 6. Head of queen. 8. Subgenital plate of male. 10. Left genitalia of male.

Fig. 4. Female of *Solenopsis molesta*, antenna. 7. Head of queen *molesta*. 9. Subgenital plate of male *molesta*. 11. Genitalia of male *molesta*.

Specimens of *rosella* from nest No. 1372, of *molesta*, male Gibraltar, No. 2704, queen, Kelley's Island No. 935.

Eyes large (as compared with those of the female of *molesta*), oval, the greatest diameter six times the distance of eye from base of mandible. Eyes sparsely hairy (fig. 6).

Structure of thorax identical with that of the female *molesta,* except that the collar on the anterior end of the pronotum, which covers the cervix and anterior ends of the proepisterna is so narrow that it can scarcely be recognized as a collar. (In the *molesta* queen it is broad and very obvious).

Petiole similar to that of *molesta* but slightly indented above. When viewed from above it is slightly indented on posterior dorsal surface and broadest through the posterior third. (In *molesta* globose from above.).

Gaster as in *molesta* with anterior and posterior contours abrupt giving a cylindrical appearance.

All major surfaces of the queen glossy smooth except for the minute and shallow punctation for the hairs. Sides of the petiole and post-petiole feebly shagreened.

Head, body and appendages covered with conspicuous pale yellow hairs. In the majority of the larger areas of head and body the hairs equal in length the first segment of funicle. On the tibiae, tarsi and antennae the hairs are half as long or less. Head hairs are inserted at distances from each other of one third to one half the length of a hair. Dorsum of thorax with fewer and longer hairs, its lower sides almost hairless, and shining. A half dozen long hairs on dorsal surface of petiole, its posterior side with shorter hairs as cover also the dorsal surface and sides of the post-petiole. (As compared with *molesta* the hairs are more sparse.).

Color: Head (preserved, faded material) light brown shading to darker brown on face and mandibles. Thorax, legs and abdomen straw yellow. The live color is very different. From my field notes on Queen No. 526. I quote: "Gaster rosy pink on dorsum of seg. 1 and anterior three fourths of seg. 2, shading caudad into orange. Venter of gaster yellow. Thorax and legs straw yellow. Head dull vermillion with blackish area on vertex and face."

*Allotype,* male from nest No. 1372. Length 3.5 mm. (dried). Figs. 1, 8 and 10.

Structure as in male *molesta,* except in genitalia. The width of the sagitta is two-thirds its length (fig. 10). (In the *molesta* male the sagitta is narrower. Its width equals half its length.) The subgenital plate, fig. 8, has its posterior and lateral edges in one evenly rounded curve. (Compare with fig. 9, *molesta,* where the slightly converging sides are almost at right angles to the transverse terminal edge.) Eyes hairy.

Color: Head a dark slate gray above and on sides. (fig. 1) below shading into straw color on the mouth parts. First segment of antenna pale brown, the antennae otherwise pale straw color as are the thorax, legs and petiole. Postpetiole and gaster a medium gray. (See fig. 1. This color of the male distinguishes the male at once from the male of *molesta* which is dark slate or black except for the pale antennae and legs.).

*Worker*: From nest No. 1372. Length 1.75 mm. Fig. 2.

Head viewed from in front nearly rectangular, its width one and one third

times into its length. Posterior angles rounded, while below the eyes the sides round gently to the bases of the mandibles. Clypeus drawn out below into a medium pair of prominent teeth separated by a shallow indentation. (In some workers from the same nest these clypeal teeth are not prominent enough to be called teeth.) External to each tooth a long bristle, while a shorter bristle arises on median line of edge of clypeus. Clypeal carinae leading to the two teeth not conspicuous. Eyes small, 2-4 facets. Antennal funicle with nine segments the last two of which form a club. The second segment of funicle is nearly equal in length to total length of segments 3 and 4. (In *molesta* segments 2, 3 and 4 of funicle are of equal length.).

Thorax as in the worker of *molesta*. Petiole, viewed from above, slightly narrower than the post-petiole. The petiole and post-petiole not as definitely indented as in these parts of the queen.

Surface glassy smooth with pilose punctation. Distribution of hairs and punctation as in the queen but hairs on thorax and legs much less abundant. See description of female (queen). Petiole with 2 erect hairs above and scattered lateral hairs. Post-petiole with 6 erect hairs and a few lateral hairs. Gaster sparsely clothed in long hairs. See fig. 2.

Color: The worker is a pale straw yellow, slightly deeper in color on head, and dorsum of thorax and gaster. (In some large workers a trace of rose pink was present in material alive. This color was, as in the queens, inside the first and second segments of the gaster.)

*Paratype material.* This consists of four nests. No. 526 one queen, collected August 6, 1931, in or near a nest (No. 525-1) of *Aphaenogaster fulva aquia* Emery. This nest was in moist coarse sand at the top level of the beach along the west shore of Pelee Point, Ontario. The queen was discovered crawling over the pile of sand after digging the Aphaenogaster nest.

Nest No. 1372 was taken June 25, 1934, eight inches to one side of a nest (No. 1371) of *Iridomyrmex analis pruinosa* Emery in coarse sand on the sand plain along west side of the sand-spit on the south shore of Pelee Island, Ontario. Nest very moist. One chamber was dug around a rotten weed stem, which had channels chewed lengthwise in it. This cavity was one half inch by one inch in size. The sand was so crumbly that no tunnels or other chambers were noticed. Twenty winged queens, 6 males and 12 workers were taken, and were later injured in the collection by fracture of the bottle neck.

Nest No. 1376, as was the next No. 4-84, in the Talbot collection, was taken on the same sand plain June 25, 1934, about 18 inches from a nest of *Formica pallide-fulva Schaufussi* Mayr. The deeper cells (12 inches or more down) of the *Formica* nest were being dug when the two nests of *rosella* were shovelled out on the large pile of loose moist sand. No nest cavities were identified. No 1376 produced 6 winged queens, 10 males and 14 workers. Nest No. 4-84, now in the Talbot collection contained 3 winged queens, 9 males and 14 workers. The workers are so minute we probably found but a fraction of them.

The writer has studied no Solenopsis material beyond the very common *Solenopsis molesta* Say. *Rosella* appears to be close to *molesta* from which spec-

ies it differs in greater length of seg. 2 of the funicle of the female and worker, in the pink color of the gaster of the queen, in the light tan or yellow thorax of the male and in the relatively larger eye of the female and wider sagitta of the male. In Creighton's monograph of New World species of Solenopsis (1930) it runs to the subgenus Diplorhoptrum, in which is also found *molesta* Say.

The name *rosella* refers to the rose pink abdomen of the queen, and means literally "the little rosy one." Types are in the writers collection.

Apparently this is an ant that is found only by digging six inches or deeper in coarse moist sand at high beach level. Probably its nests are rather permanent attachments of the more extensive nests of larger species. It is so small in the worker caste that it may be able to travel through the coarse sand it inhabits without making very definite galleries.

## SOME APPARENTLY NEW TEXAN EUPITHECIAS*.

BY J. MCDUNNOUGH,
Ottawa, Ont.

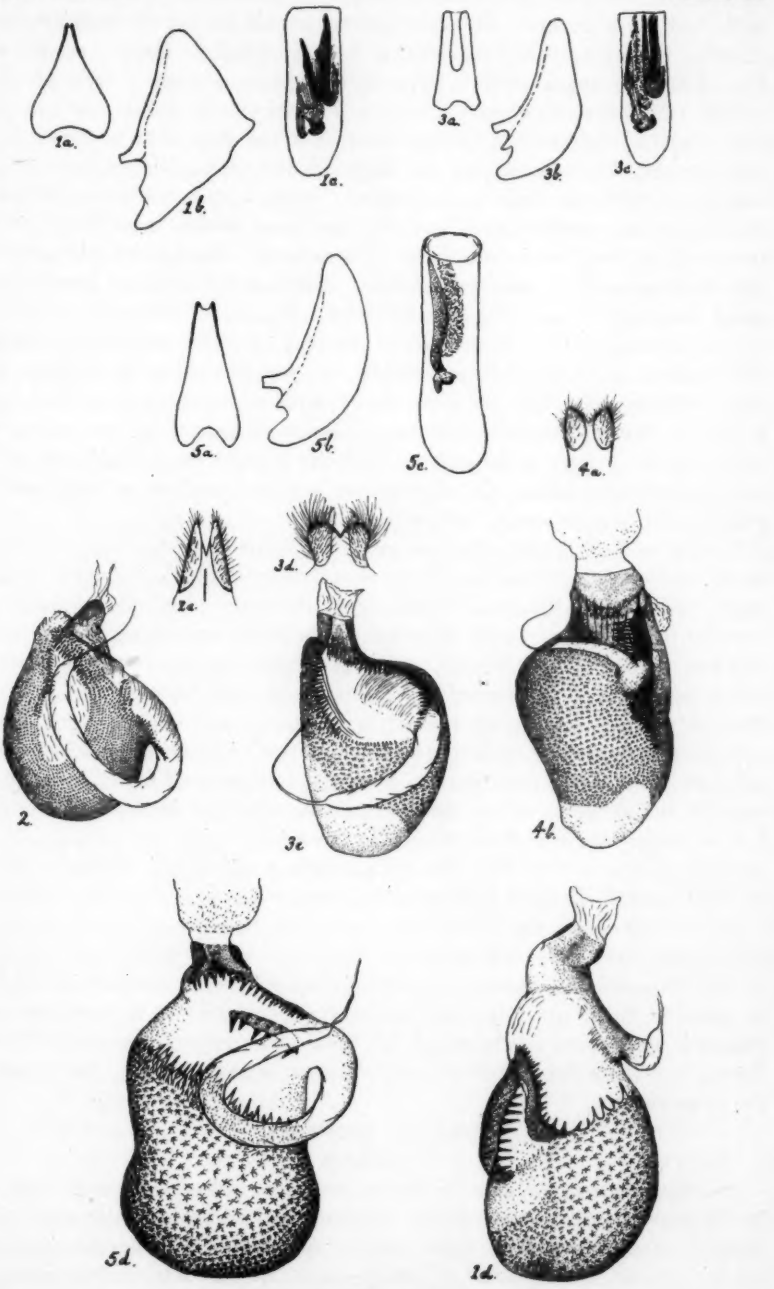
In working over considerable Eupitheciid material collected a number of years ago by the late O. C. Poling in south-western Texas (Jeff Davis Co.,) I have come across several species which appear to be undescribed. I realize that there is always a certain amount of danger in determining as new any species in this genus until such time as the genital characters of all described species in both sexes have been definitely determined. However my work in the group has progressed so far that relatively few species are now entirely unknown to me and these above mentioned Texan species do not seem to fit in at all well with the original descriptions of the "unknowns." I venture therefore to describe them as new; the genital figures given should render identification fairly easy. It might be noted that this material contained specimens of the following described species:—*huachuca* Grossb., *alpinata* Cass., *herefordaria* C. & S., *opinata* Pears., and *bolteri* Hlst., all these names having been definitely tied down by reference to type material.

### **Eupithecia pertusata** n. sp.

Fig. 1.

Palpi rather short, bushy, projecting only slightly beyond front, deep smoky; front (as far as condition of specimens permits) smooth scaled, deep smoky with a slight admixture of pale scaling. Male antennae minutely ciliate. Thorax with mixed smoky and pale scaling. Abdomen deep smoky with no noticeable dark band on anterior segments. Primaries deep smoky over a pale base and with an admixture (especially in the female) of a light ochre-brown shading. The most noticeable feature of the maculation (the specimens are none too perfect) is found in the t.p. line which is in the form of a narrow band, sharply angled below costa and then parallel to outer margin; this band is smoky in color, tinged with ochre-brown in the central section below discal spot. As far as can be made out a less strongly defined median line runs parallel to the t.p. line and there are the usual faint hair-lines crossing the median and basal spaces. The discal dot (especially in the female) is well-developed. Just beyond the t. p. band is a faint line, paralleling this band. A faint rectangular dark patch

*Contribution from the Division of Entomology (Systematic Entomology), Department of Agriculture, Ottawa.




TEXAN EUPITHECIAS

on costa before apex and traces of dark shade-patches along outer margin below apex and above tornus. S. t. line faintly visible as a pale crenulate line. A dark, terminal line slightly cut by pale at ends of veins. Fringes smoky, slightly checkered with deeper smoky. Secondaries whitish with the portion above inner margin rather heavily sprinkled with dark scales; discal dot distinct; usual lines hardly visible; subterminal line indicated by a few dark dots on veins; a heavy dark terminal line cut by pale dots opposite the veins; fringes paler and more noticeably checkered than on primaries. Beneath rather shining whitish with the median, postmedian and subterminal dark lines arising from dark blotches on costa and well defined in costal half of primaries. Secondaries with postmedian and subterminal dark lines well defined. Large discal dots and heavy dark terminal lines on all wings. Fringes checkered. Expanse 16-18 mm.

*Genitalia*—Male: Ventral plate (fig. 1a) of eighth segment weakly chitinized, conical, the sides near apex slightly more heavily chitinized to form narrow rods. Clasper (fig. 1b) short and broad with a strong blunt projection about middle of ventral margin. Aedeagus (fig. 1c) armed with two strong spines which basally appear to be covered with an indefinitely defined and vertically striate membrane; below this and more or less conjoined are a weakly chitinized rod and the usual irregular basal-piece.

*Female*: (Fig. 1d), Ostium weak, membranous. Ductus bursae broad at origin, with a half-ring of chitin, open ventrally; the neck is weakly chitinized, short, broad, the chitinous area descending down the right side of bursa to the opening of the ductus seminalis which arises semi-ventrally, is broad at inception but narrows quickly to a fine tube; the entrance to this ductus is armed with a few spines, more numerous and extended further backward on dorsal side than on ventral. The upper two-fifths of the bursa is membranous, the lower portion almost entirely spined and with large marginal spines which on the left side are continued upward by two heavily spined bars of chitin, meeting about opposite the inception of the ductus seminalis; the area between these chitinous bars is unspined almost to fundus of bursa-sack.

*Holotype*—♂, S. W. Texas, May-June 1928, (O. C. Poling); No. 4380 in the Canadian National Collection, Ottawa.

*Allotype*—♀, same data.

*Paratype*—1 ♂, same data.

The species has a certain superficial resemblance, especially in the female, to *anticaria* Wlk., and this association is borne out by the shape of the ventral plate and the clasper in the male; the female bursae are, however, entirely different, and there appears to be only a single accessory cell in the venation of the primaries.

### **Eupithecia prostrata** n. sp.

Fig. 3.

Palpi moderately long, bushy, extending considerably beyond front, largely blackish with slight admixture of white scaling. Front smooth-scaled, blackish, crossed by a faint whitish band anterior to antennae. Male antennae shortly ciliate. Thorax clothed with an admixture of whitish and smoky scaling. Abdomen deep smoky with indications of a narrow, darker band across second seg-

ment. Primaries rather narrow and pointed, deep smoky over a pale base, the paler color being most evident beyond the t. p. line which it serves to relieve; all cross-lines rather indistinct, angled below costa and then rather rigidly inwardly oblique to inner margin, accentuated partially by blackish dots on the veins, especially the case with the t. p. line. Distinct black discal dot. S. t. line accentuated by a subterminal dark costal patch and a narrow dark shade-band but rather improminent, pale, slightly wavy, and terminating above tornus in a slightly broadened pale patch. A broken blackish terminal line and smoky fringes, slightly checkered. Secondaries dull whitish with strong blackish sprinkling along inner margin; on the inner half of wing traces of postmedian and subterminal lines, marked by dark dots on veins and not extending to costa. A very minute discal dot is present. Terminal dark line and fringes paler than on primaries and more evidently checkered. Beneath pale smoky with dark discal dots on all wings and indications of t. p. and s. t. lines on primaries; on secondaries postmedian and subterminal lines moderately well defined. Dark terminal line on all wings and fringes as above. Expanse 16-18 mm.

*Genitalia*—Male: Ventral plate of eighth segment (fig. 3a) weakly chitinized, bifid for over half its length, each prong being rather broad but not raised, nor projecting apically. Clasper (fig. 3b) rather narrow and tapering apically. Aedeagus (fig. 3c) with a cluster of three long spines, bluntly pointed and more or less superimposed, bent forward at bases and apparently more or less connected. In addition there is a long, thin irregular piece of chitin which is partially connected basally with the irregularly twisted basal piece.

*Female*: Ovipositor (fig. 3d) broad and rounded apically, very hairy. Ostium weak, membranous. Ductus bursae short, rather narrow, with chitinous half-ring, open ventrally. Bursa (fig. 3e) rather rectangular with slight shoulder at left of ductus. There is no neck but immediately below the chitin-ring on ventral side is an unspined space from which arises the ductus seminalis; this is very broad at first, and somewhat raised above the surface of the bursa; it extends along the right ventral side of the bursa to about the middle, then narrows somewhat and bends sharply across the sack to the left side where it suddenly contracts to a small tube which is directed caudad. The fundus of the bursa sack is unspined and this area extends upward along the left side for over half the length of the sack; the remainder is spined, including the entire dorsal side; the spines are considerably longer and more numerous in the upper section especially in the vicinity of the shoulder.

*Holotype*—♀, Davis Mts., Jeff Davis Co., 5,000 ft., March 1928 (O. C. Poling); No. 4381 in the Canadian National Collection, Ottawa.

*Allotype*—♂, same data.

*Paratypes*—4 ♀, same data.

Superficially, especially in the male sex, very difficult to separate from *alpinata* Cass.; the general wing-color appears on the whole slightly darker.

Females can be readily separated by an examination of the ovipositor which in *alpinata* (fig. 2a) is generally protruding, long, narrow and pointed apically, of a pale yellowish color and only sparsely hairy; this character has been found in Cassino's allotype, which Dr. Banks has kindly examined at my request; in con-

sequence of this easily observed character I have chosen a female as holotype of the present species. I have found no satisfactory superficial characters by which to separate the males of the two species, the ventral plate of the eighth abdominal segment being similar in both. Judging by paratype material before me Cassino included males of both species in his type series of *alpinata* but the figure of the male genitalia, which in the original description he states he was presenting, was never given. Dr. Banks informs me that no slide of the genitalia of the holotype male has been made and as it is not feasible at the present time to make this I am forced to presuppose that Cassino's sex associations agree with my own; according to my slides *alpinata* male shows an additional long isolated spine in the aedeagus and the arrangement in the cluster of three spines is slightly different from that of *prostrata*.

**Eupithecia persimulata** n. sp.

Fig. 4.

*Female*. Palpi moderately long, considerably exceeding front, deep smoky. Vestiture of head, thorax, and abdomen (as far as can be ascertained from rubbed specimens) dull gray-brown; traces of a darker band crossing second abdominal segment dorsally. Primaries more or less unicolorous gray-brown with maculation very obscure; the most prominent features are a moderately large dark discal dot, a smoky t. p. line, curved outwards around discal dot and then parallel to outer margin and a faint, whitish, crenulate s. t. line. There are traces of the t. a. and median lines, slightly accentuated by dark dots on cubital vein and vein 1. A broken dark terminal line and smoky fringes, showing the usual slight checkering. Secondaries paler than primaries with smaller discal dot and traces of postmedian and subterminal curved lines. Terminal line and fringes as on primaries. Beneath pale smoky gray, with the discal dots and postmedian and subterminal lines fairly well defined on all wings; terminal area as above. Expanse 17 mm.

*Genitalia*—Female: Ostium membranous. Ductus bursae (fig. 4b) broad, membranous in proximal third and with the usual open chitinous ring encircling the neck. From this ring a strong, chitinous, trough-like band descends on the left side to about the midddle of the bursa, being armed on its inner side with very long spines. Dorsally below the neck is a small, unspined, strigate area from the lower left side of which the ductus seminalis arises as a small bulb from which a tube of moderate width extends across the bursa to the right side where it narrows suddenly to a very fine tube. With the exception of the unspined fundus the remainder of the dorsal surface of the bursa is finely spined. On the ventral side a gradually narrowing, unspined band extends backward from fundus almost to the neck, ending in a group of small spines which connect with the spined area on the right side.

*Holotype*—♀, S. W. Texas, May-June 1928 (O. C. Poling); No. 4382 in the Canadian National Collection, Ottawa.

*Paratype*—1 ♀, same data.

**Eupithecia protoptata** n. sp.

Fig. 5.

Palpi moderately long, bushy, protruding considerably beyond front, largely black-brown. Antennae of male shortly ciliate. Front black-brown, crossed

by a band of paler sprinkling anterior to antennae. Back of head, collar, patagia and base of abdomen light grayish with slight peppering of darker scales: remainder of thorax and abdomen smoky brown, latter crossed by a moderately well-defined blackish band on second segment. Primaries gray-brown with the transverse lines clearly defined, blackish, very fine; a curved basal line; t. a. line geminate, outcurved below costa, then strongly inwardly oblique, preceded by a parallel, somewhat heavier line; t. p. line, curved outward and rather heavier below costa, angled gently inward on vein 2; median space slightly paler than rest of wing with distinct dark discal dot and crossed by two closely approached hair-lines, more or less parallel to t. p. line and bending inward across discal spot to costa; beyond t. p. line at a short distance is a parallel line arising from a slight dark patch on costa, the included space being faintly paler than terminal area of wing and bisected by a very fine hair-line. S. t. line hardly evident, best indicated by a slight pale curved mark above tornus and a small shade-patch on costa before apex. A dark broken terminal line and concolorous, faintly checkered fringes. Secondaries very pale smoky with considerable sprinkling of blackish scales on inner half of wing; a dark discal streak and curved postmedian and subterminal lines; a dark terminal line; fringes paler and more clearly checkered than on primaries. Beneath dull silvery whitish with apex of primaries light smoky; discal dots and postmedian and subterminal lines well defined on all wings, the latter on primaries enlarged to a small patch on costa; on secondaries a curved subbasal line is fairly evident; a dark terminal line on both wings. Expanse 17-18 mm.

*Genitalia*—Male: Ventral plate (fig. 5a) of eighth segment bluntly conical, lateral edges thickened apically and protruding bluntly slightly beyond the surface of the plate. Clasper (fig. 5b) rather narrow and tapering apically. Aedeagus (fig. 5c) armed solely with a band-like strip of weak chitin and the usual bent and irregular basal piece.

*Female*: Ostium subrectangular, finely spiculate. Ductus bursae (fig. 5d) short, moderately broad, with the usual chitinous semi-ring distally; on the dorsal side of bursa this ring shows a terminal row of strong spines which extend downward along the right side to the mouth of the ductus seminalis. This ductus arises in the upper third of the sack-like bursa on the right side, is broad for a considerable length, making a complete circle across the ventral side of the bursa and then narrowing to a very fine tube which proceeds caudad; on the ventral side of the entrance to the ductus is a short strip of strong spines. The upper third of the bursa is otherwise without armament but the balance of the sack is completely and heavily covered inwardly with strong spines.

*Holotype*—♂, S. W. Texas, May-June 1928, (O. C. Poling); No. 4383 in the Canadian National Collection, Ottawa.

*Allotype*—♀, same data.

*Paratypes*—2 ♂, same data.

EXPLANATION OF PLATE 20

Fig. 1. *Eupithecia pertusata* n. sp.; 1a. Male, ventral plate; 1b. Clasper; 1c. Aedeagus; 1d. Female, bursa, ventral view.

Fig. 2. *Eupithecia alpinata* Cass. Female, bursa (left side); 2a. Ovipositor (ventral).

Fig. 3. *Eupithecia prostrata* n. sp.; 3a. Male, ventral plate; 3b. Clasper; 3c. Aedeagus; 3d. Female, ovipositor (ventral); 3e. Bursa, ventral view.

Fig. 4. *Eupithecia persimulata* n. sp.; 4a. Female, ovipositor; 4b. Bursa (dorsal view).

Fig. 5. *Eupithecia protoptata* n. sp.; 5a. Male, ventral plate; 5b. Clasper; 5c. Aedeagus; 5d. Female, bursa (ventral view).

## BOOK NOTICE.

Faunistischer Fuhrer durch die Coleopteren-Literatur, Band I, Lieferung 1, 2; by S. Schenkling. Published by Verlag Gustav Feller, Neubrandenburg (Meckl.).

Under the above title, the author intends to publish in four volumes a list, arranged geographically, of the most important literature on the beetles of the world. Volume I will list the literature relating to the European fauna. It will appear in nine or ten parts, comprising 600 or more pages, which the author intends to complete in 1940. The price of each part is RM. 6, with 25% discount to foreign subscribers. Volume II will consider the literature of Palaearctic Africa and Asia and the Indo-Malay region, volume III that of the Ethiopian region, Australia, and Oceania, and volume IV that of America.

Parts 1 and 2 of the first volume, including together pages 1 to 128, have appeared. The first 65 pages list titles dealing with the palaearctic region as a whole. General titles are listed first, and the remaining are listed systematically under family headings. Pages 65 to 113 list titles considering Europe as a whole, the titles of more general works first, then titles classified by family. The remaining pages consider literature dealing with Scandinavia, Norway, and Sweden. As a guide to the literature, the work will prove useful to all entomologists.

W. J. BROWN.

## RESEARCH NOTES

### AN EXOTIC MOTH TAKEN AT QUEBEC

On October the 6th, Mr. Omer Caron, Provincial Botanist, brought to the Laboratory of the Plant Protection Bureau, a large moth which had been captured a few days previous by Mr. Samson on du Fort Street, near the general Post-Office.

After a careful examination, it was found that this specimen was an adult of *Thysania zenobia* Cram.

According to the annual reports of the Entomological Society of Ontario, previous captures of this species have been made at the following localities.

1906 1 specimen taken at St. John, N. B. on September the 19th of the same year, 1 specimen taken at Toronto.

1912 1 specimen taken at Cartwright, Man. on September the 15th.

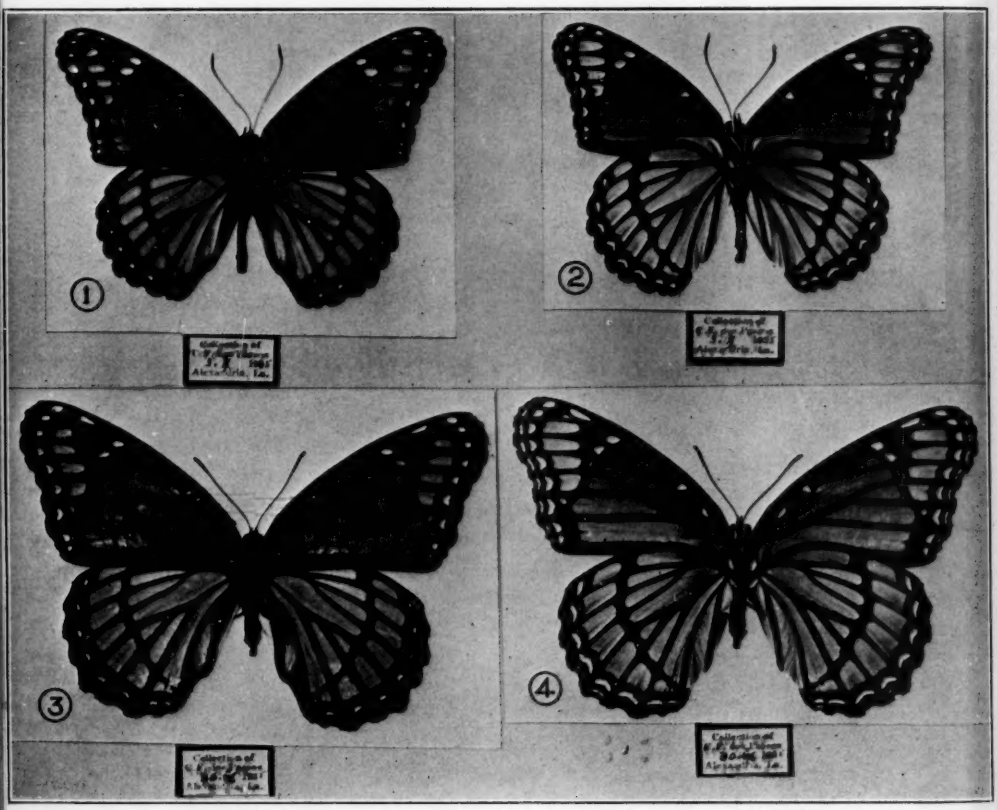
1930 1 specimen taken at Ricetown, Sask.

The specimen taken at Quebec had been somewhat damaged by the storm. It is now in the collection of the Plant Protection Bureau.

JOS. I. BEAULNE

Dept. of Agriculture, Quebec.

Mailed Saturday, November 26th, 1938.



*B. archippus watsoni* n. ssp.

Fig. 1. Holotype, ♂, upperside.
Fig. 2. Holotype, ♂, underside.
Fig. 3. Allotype, ♀, upperside.
Fig. 4. Allotype, ♀, underside.